



# Antenna Datasheet

**Product OC:** YB0031AA

**Version:** 2.0

**Date:** 2023-09-07

**Status:** Released

**Product Name:** 4G + GNSS 2IN1 Combo Antenna

**Key Features:**

Frequency Band:

4G: 698–960 MHz; 1710–2690 MHz

GNSS: 1559–1592 MHz

Dimensions:  $\Phi 84 \times 17.5$  mm

Efficiency: Up to 61 % (4G-FS)

GNSS LNA Gain: 26  $\pm$ 3 dB

RoHS Compliant

IP66

# Overview

To meet customers' requirements for the high performance, high integration, and integrated appearance of their products, Quectel provides a combined antenna box series. The antenna box can integrate a variety of antennas, such as 5G, 4G, GNSS, Wi-Fi antennas, to achieve communication functions of 5G MIMO, 4G, GNSS, and Wi-Fi. These antenna boxes can be mounted on the surface of devices via screw, adhesive or other methods, supports multiple connector types and cable lengths. It is a more flexible and reliable high-performance antenna solution for outdoor applications.

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# 1 Specification

**Test Condition: On 300 × 300 mm Metal Plane & In Free Space**

## 1.1. Electrical

Electrical Specifications		
Frequency Range	4G	698–960 MHz, 1710–2690 MHz
	GNSS	1559–1592 MHz
Radiation Pattern	4G	Omni-directional
	GNSS	Directional
Polarization	4G	Linear
	GNSS	RHCP
Impedance		50 Ω
Isolation	MP	≤ -9.3 dB
	FS	≤ -13.7 dB

- MP: On 300 × 300 mm Metal Plane
- FS: In Free Space

## 1.1.1. 4G

Electrical - Detail									
SPEC	Band	Band	B71	B12 /B13 /B28	B5 /B8 /B26	B1 /B2 /B3	B40	Wi-Fi 2G	B38 /B41
	Freq. (MHz)	600– 700	700– 810	820– 960	1700– 2170	2300– 2400	2400– 2500	2500– 2690	
Max. VSWR	MP	-	2.5	2.7	5.4	4.0	4.0	3.6	
	FS	-	2.5	2.0	3.0	3.4	3.3	2.9	
Max. Return Loss (dB)	MP	-	-7.3	-6.8	-3.3	-4.4	-4.4	-4.9	
	FS	-	-7.3	-9.4	-6.0	-5.3	-5.5	-6.2	
AVG Eff. (%)	MP	-	33.1	35.4	31.4	33.5	31.0	18.0	
	FS	-	45.8	48.6	49.5	33.2	41.6	42.0	
AVG AVG Gain (dB)	MP	-	-4.9	-4.6	-5.2	-4.8	-5.1	-7.6	
	FS	-	-3.4	-3.1	-3.1	-4.8	-3.8	-3.8	
Max. Peak Gain (dBi)	MP	-	0.2	1.8	2.7	2.4	2.3	1.0	
	FS	-	1.2	1.8	2.3	0.5	1.3	1.2	
VSWR	MP	≤ 5.4							
	FS	≤ 3.4							
Return Loss	MP	≤ -3.3 dB							
	FS	≤ -5.3 dB							
Peak Gain	MP	≤ 2.7 dBi							
	FS	≤ 2.3 dBi							

1.1.2. GNSS

Frequency (MHz)	Band	GPS L5	GALILEO	GPS L2	GLONASS	BEIDOU	BEIDOU	GPS L1	
		E5a	E5b	QZSS L2C	G2	B3	B1I	E1	GLONASS
		BEIDOU B2a-B2I	BEIDOU B2b					BEIDOU B1C	G1
		QZSS L5						QZSS L1	
		IRNSS L5							
		1176	1207	1227	1248	1268	1561	1575	1602
VSWR	MP	-	-	-	-	-	1.2	1.5	-
	FS	-	-	-	-	-	1.6	1.7	-
Return Loss (dB)	MP	-	-	-	-	-	-22.4	-14.5	-
	FS	-	-	-	-	-	-12.4	-12.3	-
Efficiency (%)	MP	-	-	-	-	-	53.7	53.5	-
	FS	-	-	-	-	-	56.4	51.9	-
AVG Gain (dB)	MP	-	-	-	-	-	-2.7	-2.7	-
	FS	-	-	-	-	-	-2.5	-2.9	-
Peak Gain (dBi)	MP	-	-	-	-	-	2.4	2.1	-
	FS	-	-	-	-	-	1.7	0.4	-
Axial Ratio (dB) Theta = 0 (deg)	MP	-	-	-	-	-	5.9	11.6	-
	FS	-	-	-	-	-	17.2	5.1	-

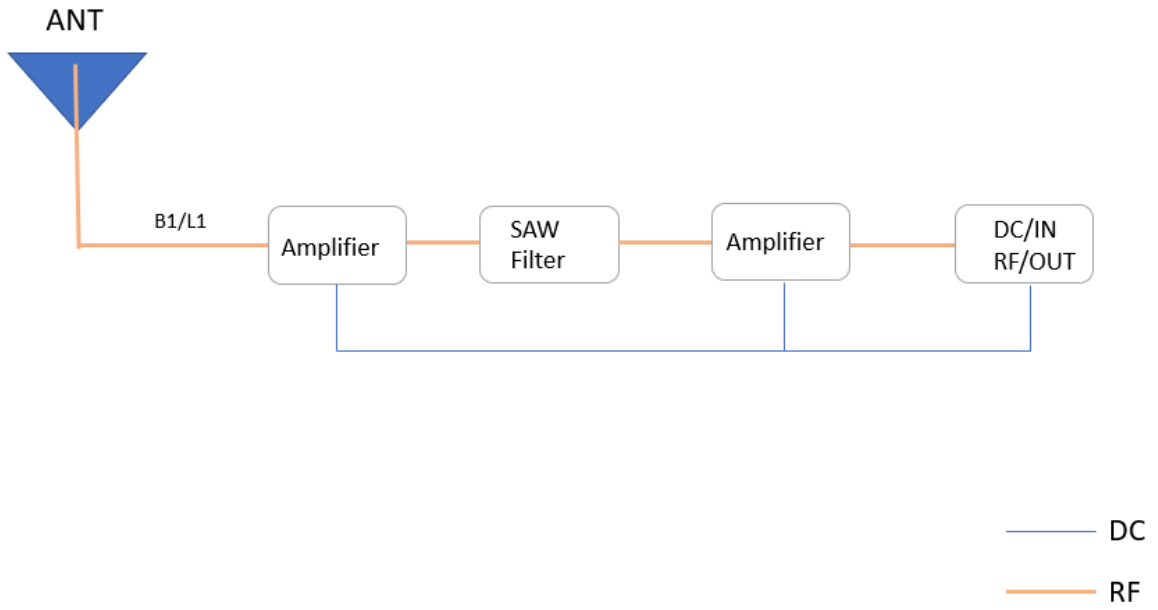
**LNA Electrical**

<b>LNA Gain</b>	26 ±3 dB
<b>Noise Figure</b>	≤ 1.1 dB
<b>Output VSWR</b>	< 2.0
<b>Input VSWR</b>	< 2.0
<b>Filter Out-of-band Attenuation</b>	45 dB f0 ±100 MHz f0 (1580 MHz)
<b>Working Voltage</b>	2.7–3.3 V
<b>Working Current</b>	10 ±1 Ma @ 3.0 V
<b>Impedance</b>	50 Ω

## 1.2. Mechanical & Environmental

Mechanical		
Antenna Dimensions		Φ 84 × 17.5 mm
Antenna Material & Color		ABS + PC & Black
Cable Type & Color & Length	4G	RG174 & Black & 300 mm
	GNSS	RG174 & Black & 300 mm
Connector Type		SMA Male
Mounting Type		Adhesive
Weight		Typ. 59.8 g
Environmental		
Operation Temperature		-40 °C to +85 °C
Storage Temperature		-40 °C to +85 °C
Ingress Protection (IP) Rating		IP66
RoHS Compliant		Yes

### 1.3. Block Diagram (Active Antenna)

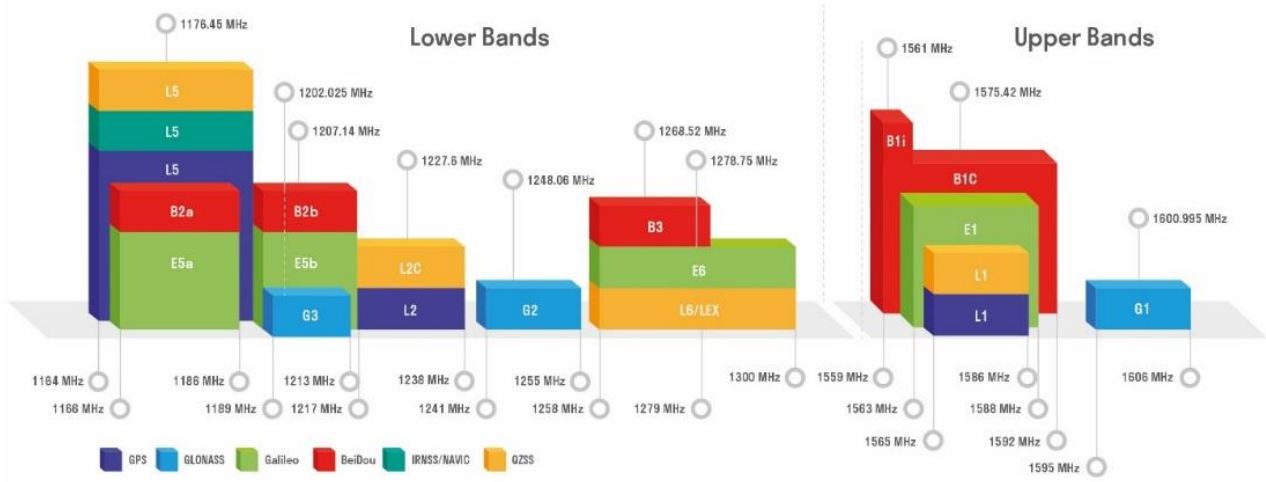




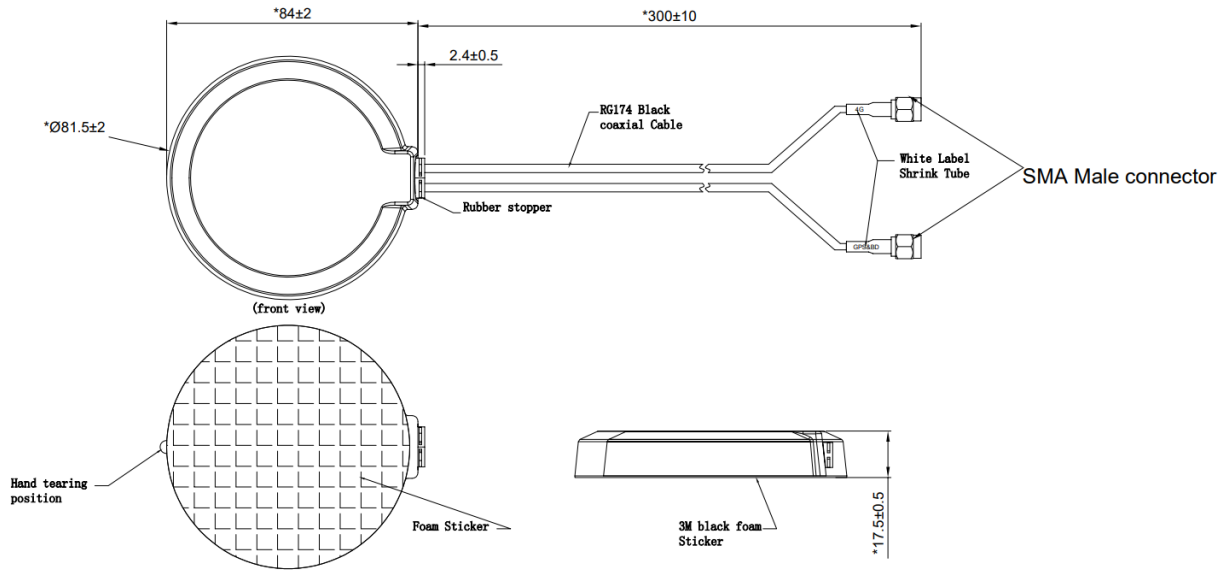
## 1.4. Supported GNSS Frequency Bands

GNSS Frequency Bands (MHz)					
<b>GPS</b>	<b>L1</b> Centre 1575.42 (1565–1586)	<b>L2</b> Centre 1227.6 (1217–1238)	<b>L5</b> Centre 1176.45 (1164–1189)		
	√	-	-		
<b>GLONASS</b>	<b>G1-L10C-L10F</b> Centre 1601 (1595–1606)	<b>G2-L20C-L20F</b> Centre 1248.06 (1241–1255)	<b>G3-L30C</b> Centre 1202.025 (1189–1213)		
	-	-	-		
<b>GALILEO</b>	<b>E1</b> Centre 1575.42 (1563–1588)	<b>E5a</b> Centre 1176.45 (1166–1187)	<b>E5b</b> Centre 1207.14 (1197–1218)	<b>E6</b> Centre 1278.75 (1258–1300)	
	√	-	-	-	
<b>BEIDOU</b>	<b>B1I</b> Centre 1561.098 (1559–1564)	<b>B1C (BeiDou-3)</b> Centre 1575.42 (1559–1592)	<b>B2a</b> Centre 1176.45 (1166–1187)	<b>B2b-B2I</b> Centre 1207.14 (1197–1217)	<b>B3</b> Centre 1268.52 (1258–1279)
	√	√	-	-	-
<b>QZSS</b>	<b>L1</b> Centre 1575.42 (1573–1578)	<b>L2C</b> Centre 1227.6 (1226–1229)	<b>L5</b> Centre 1176.45 (1166–1187)	<b>L6</b> Centre 1278.75 (1257–1300)	
	√	-	-	-	
<b>IRNSS</b>	<b>L5</b> Centre 1176.45 (1164–1189)				
	-				

### GNSS Bands and Constellations



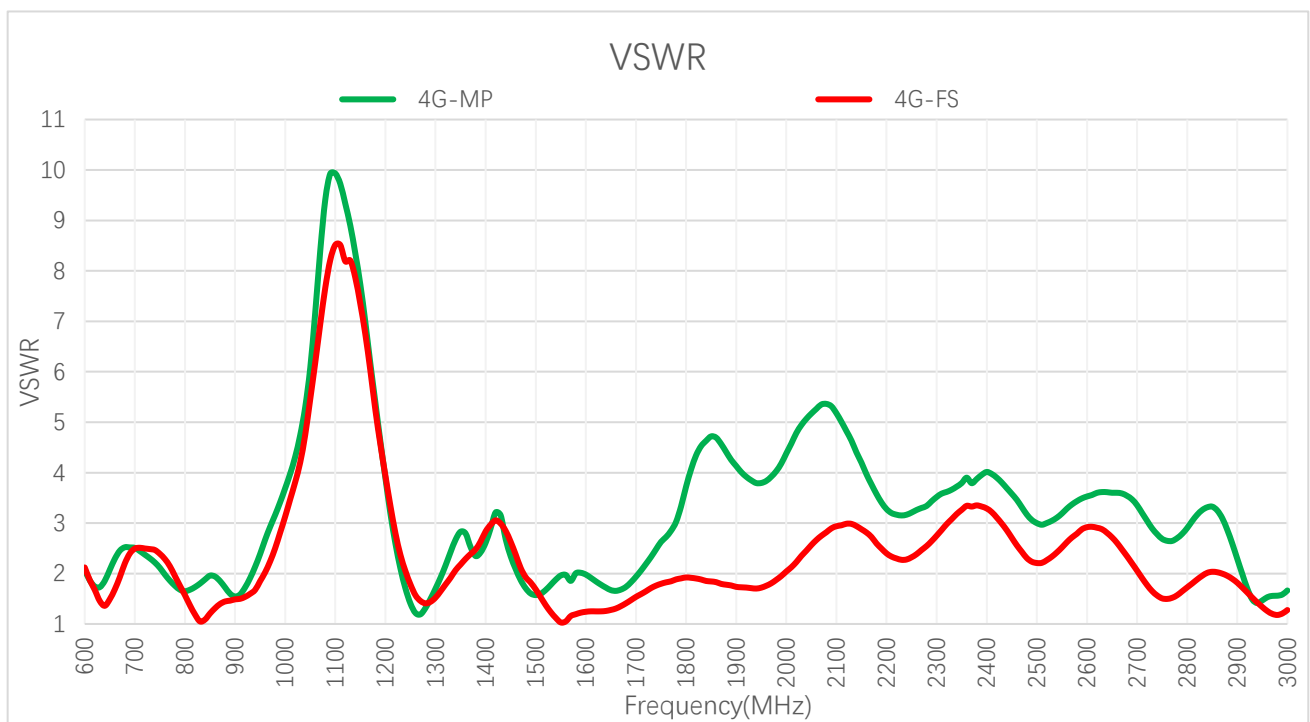
# 2 Drawing



# 3 Detailed Performance

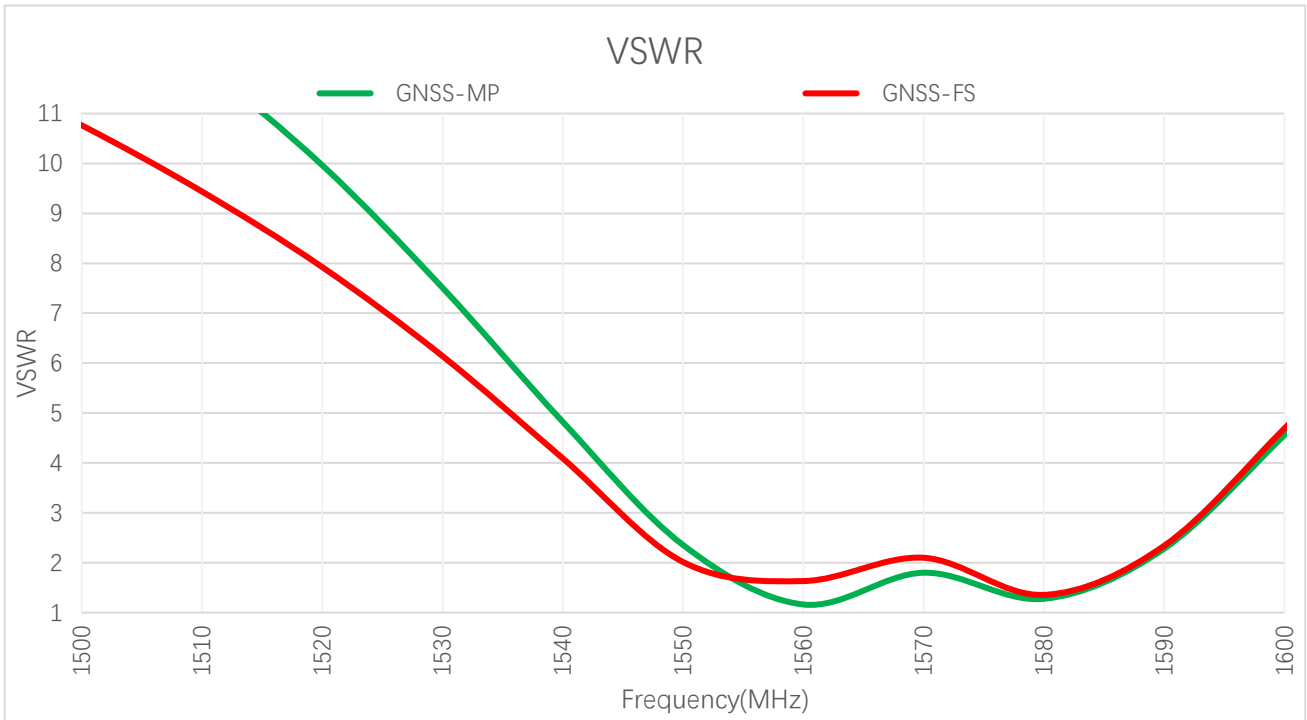
## 3.1. S-Parameter Test

### 3.1.1. VSWR



**VSWR - 4G**

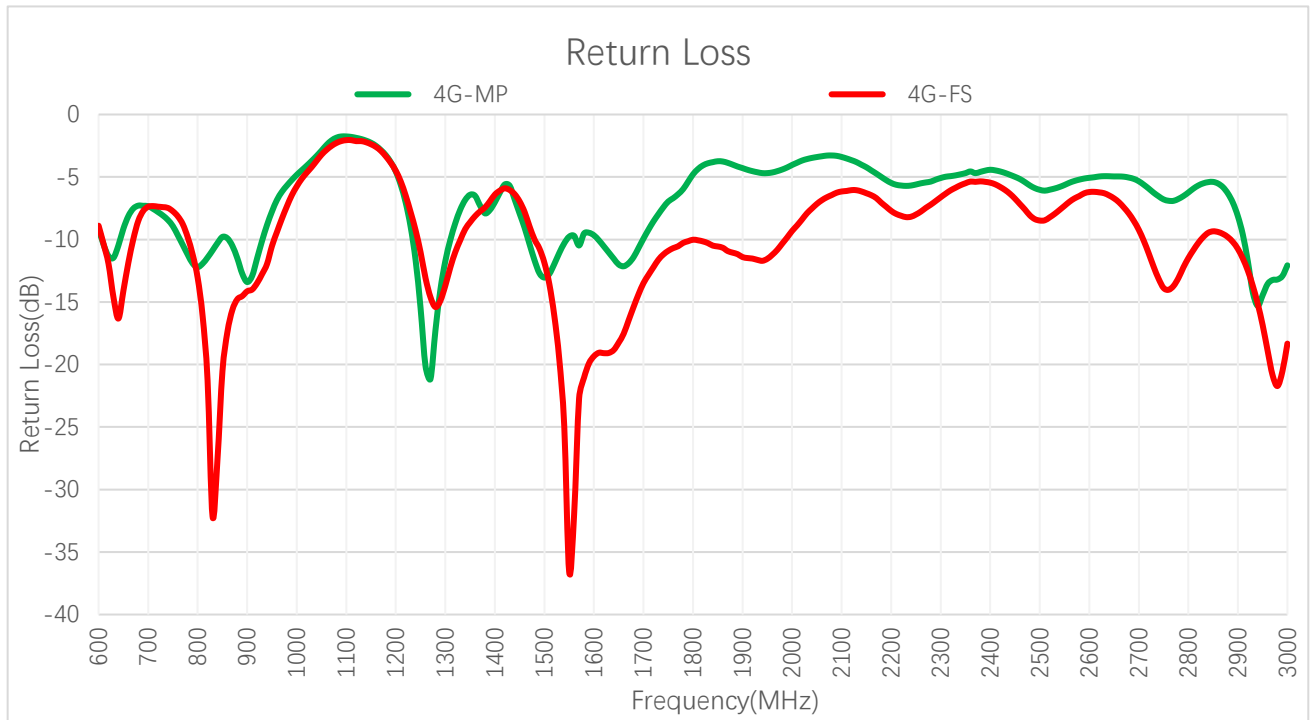
Frequency (MHz)	600	630	710	830	900	960	1440	1710	1740	1880	
VSWR	MP	-	-	2.4	1.8	1.5	2.7	-	2.1	2.5	4.4
	FS	-	-	2.5	1.1	1.5	2.0	-	1.6	1.8	1.8
Frequency (MHz)	1950	2140	2350	2450	2600	2690	4700	5000	5500	6000	
VSWR	MP	3.8	4.4	3.8	3.6	3.5	3.5	-	-	-	-
	FS	1.7	2.9	3.3	2.7	2.9	2.2	-	-	-	-



**VSWR - GNSS**

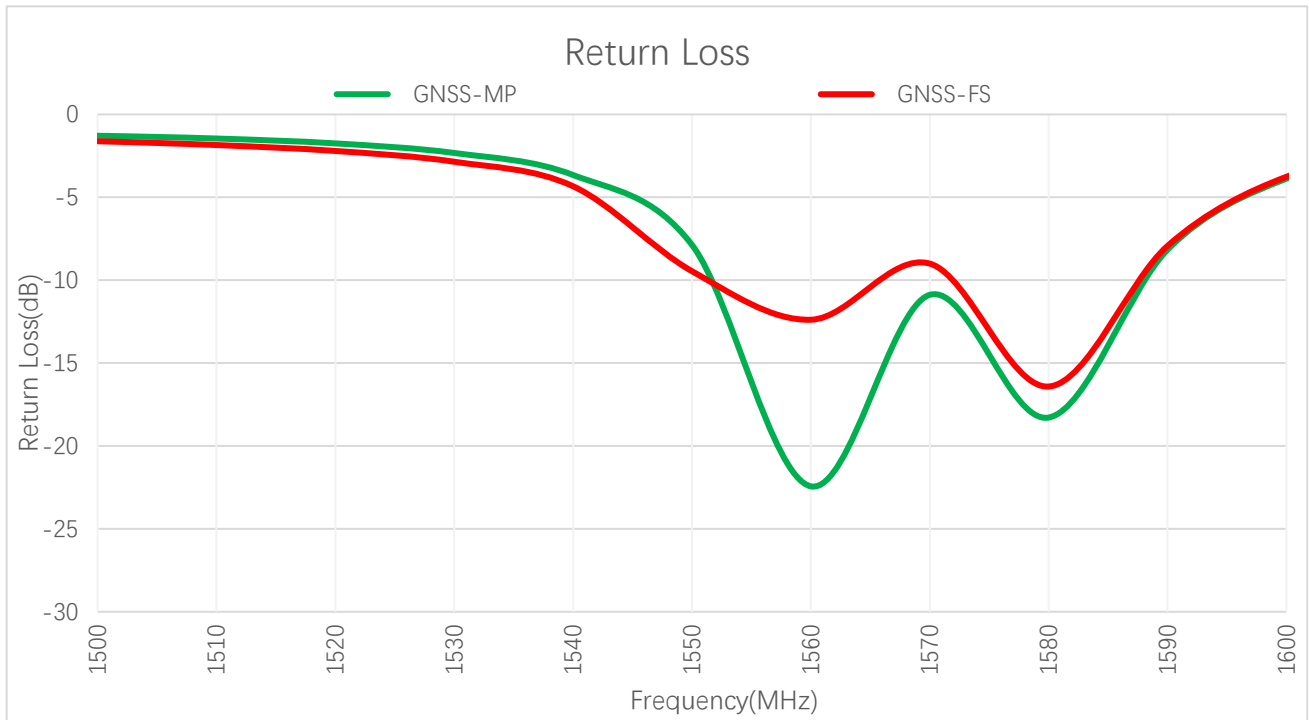
Frequency (MHz)		1176	1207	1227	1248	1268	1561	1575	1602
VSWR	MP	-	-	-	-	-	1.2	1.5	-
	FS	-	-	-	-	-	1.6	1.7	-

**3.1.2. Return Loss**



**Return Loss (dB) - 4G**

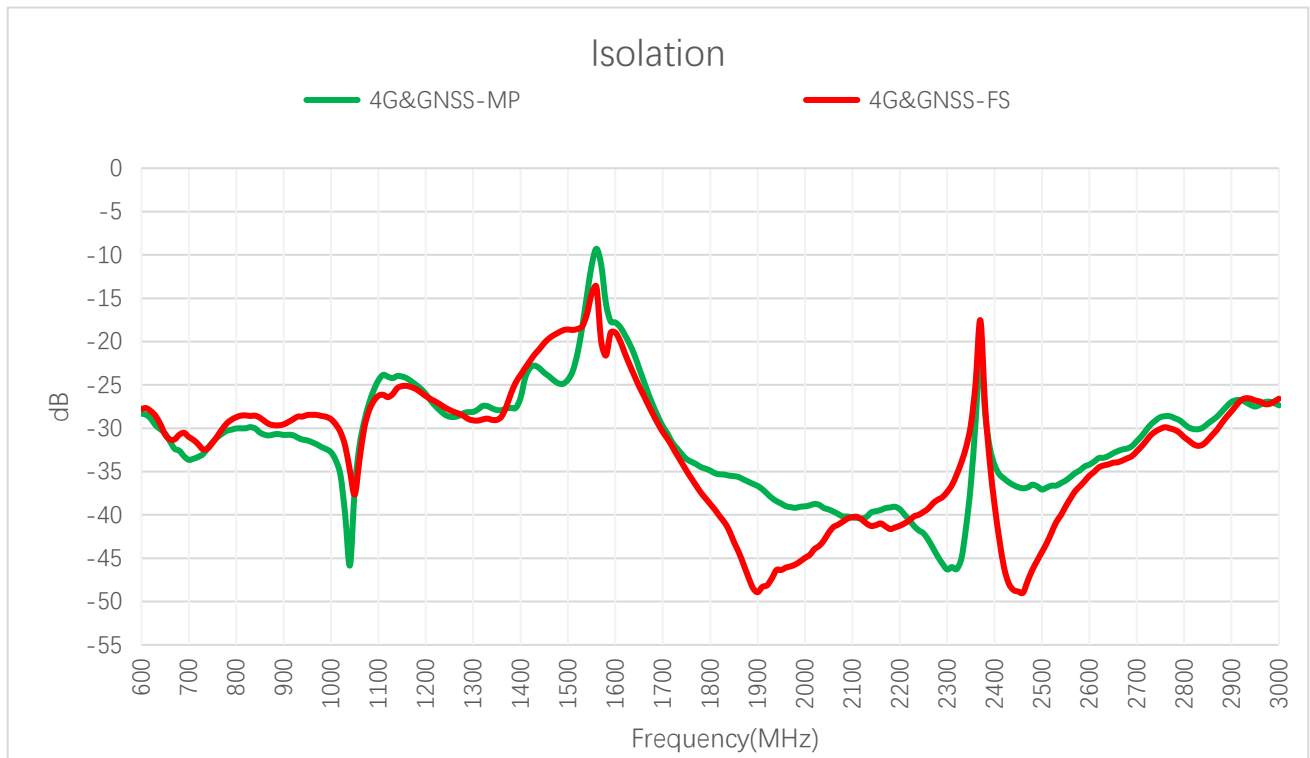
Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
Return Loss (dB)	MP	-	-	-7.5	-10.9	-13.4	-6.8	-	-9.2	-7.4	-4.0
	FS	-	-	-7.3	-32.1	-14.1	-9.4	-	-12.8	-11.2	-11.1
Frequency (MHz)		1950	2140	2350	2450	2600	2690	4700	5000	5500	6000
Return Loss (dB)	MP	-4.7	-4.0	-4.7	-5.0	-5.1	-5.2	-	-	-	-
	FS	-11.5	-6.2	-5.5	-6.7	-6.2	-8.5	-	-	-	-



**Return Loss (dB) - GNSS**

Frequency (MHz)		1176	1207	1227	1248	1268	1561	1575	1602
Return Loss (dB)	MP	-	-	-	-	-	-22.4	-14.5	-
	FS	-	-	-	-	-	-12.4	-12.3	-

**3.1.3. Isolation**

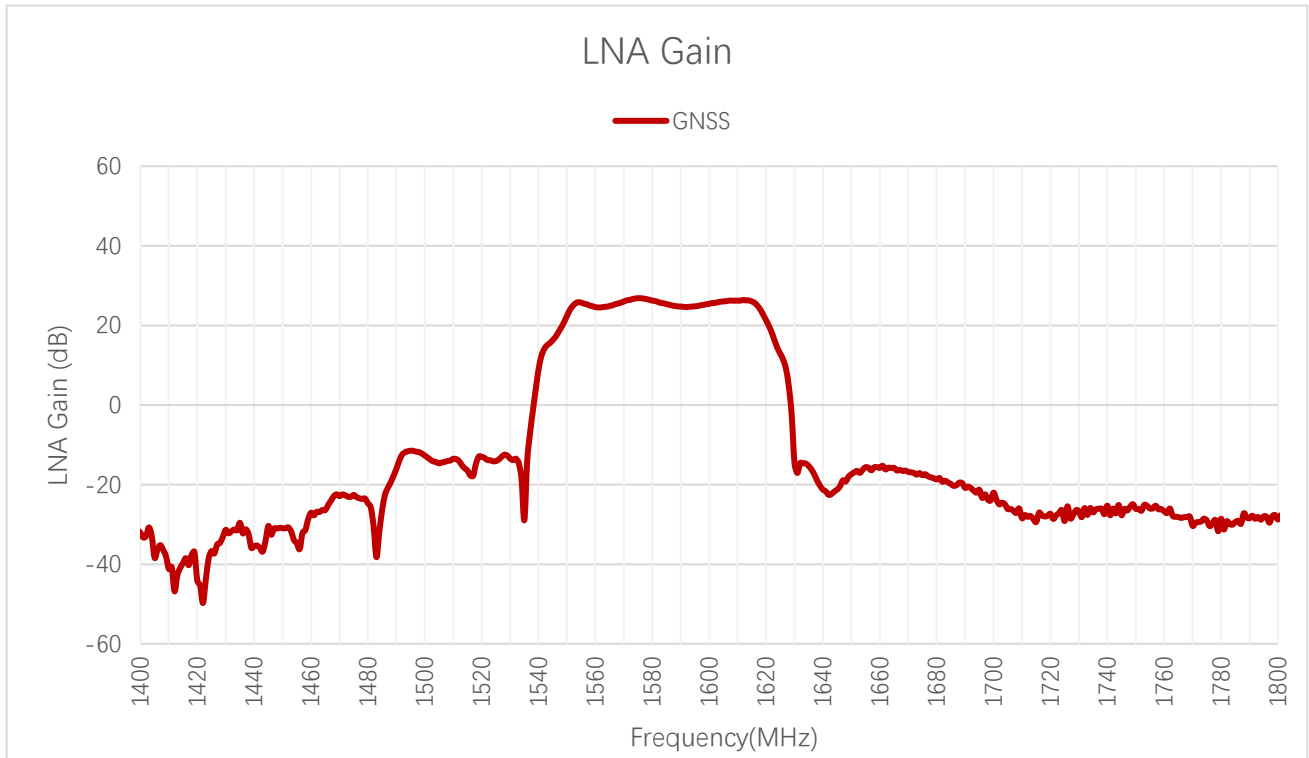


**Max Isolation (dB) - 4G & GNSS**

Band	B71	B12/ B13/ B28	B5/ B8/ B26	B1/ B2/ B3	B40	Wi-Fi 2G	B38/ B41	BEIDOU B1I	GPS L1
Freq. (MHz)	600-700	700-810	820-960	1700-2170	2300-2400	2400-2500	2500-2690	1559-1564	1565-1586
MP	-	-30.0	-29.9	-29.8	-20.4	-34.3	-32.1	-9.3	-11.1
FS	-	-28.6	-28.5	-30.4	-17.5	-38.9	-33.2	-13.7	-20.0



**3.1.4. GNSS LNA Gain**

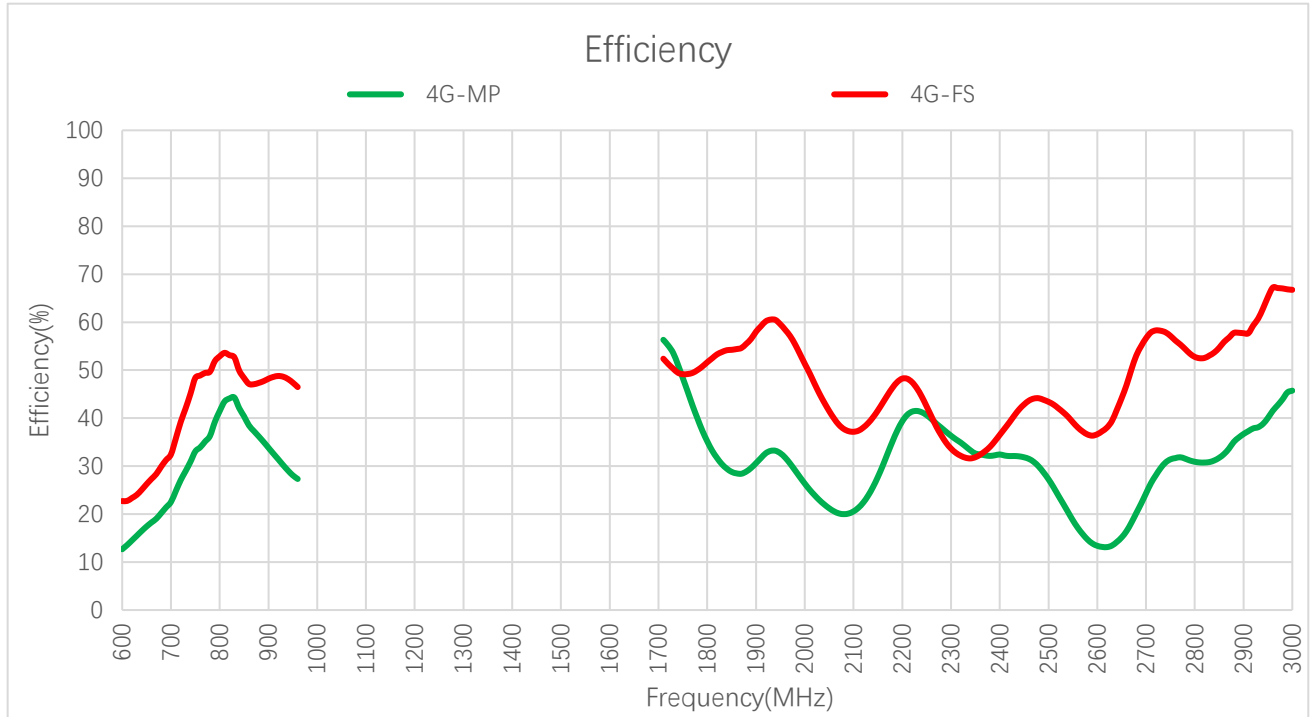


**LNA Gain (dB)**

Frequency (MHz)	1176	1207	1227	1248	1268	1561	1575	1602
LNA Gain (dB)	-	-	-	-	-	24.5	26.8	-

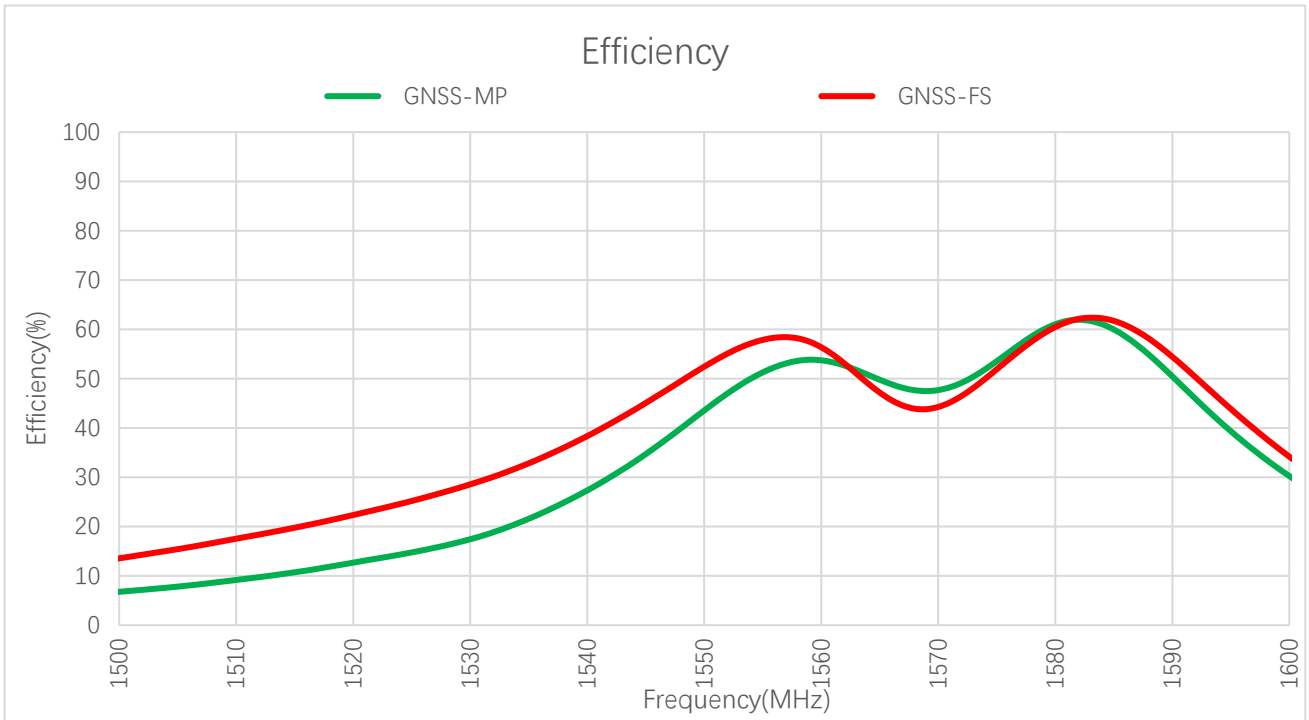
### 3.2. Radiation Performance Test

#### 3.2.1. Efficiency



**Efficiency (%) - 4G**

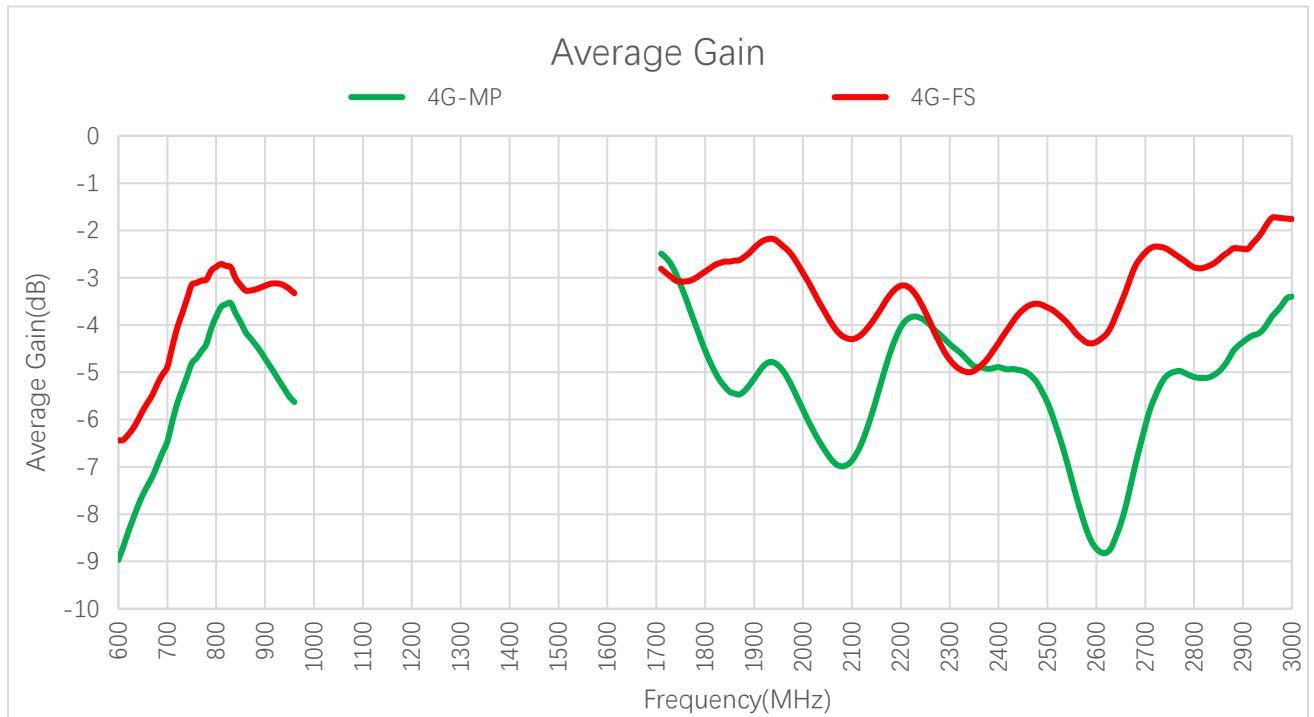
Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
Efficiency (%)	MP	-	-	24.8	44.3	33.8	27.3	-	56.3	51.1	28.9
	FS	-	-	35.8	52.7	48.2	46.5	-	52.4	49.5	55.5
Frequency (MHz)		1950	2140	2350	2450	2600	2690	4700	5000	5500	6000
Efficiency (%)	MP	32.7	25.6	32.6	31.8	13.4	22.2	-	-	-	-
	FS	59.6	40.2	31.9	42.9	36.6	55.0	-	-	-	-



**Efficiency (%) - GNSS**

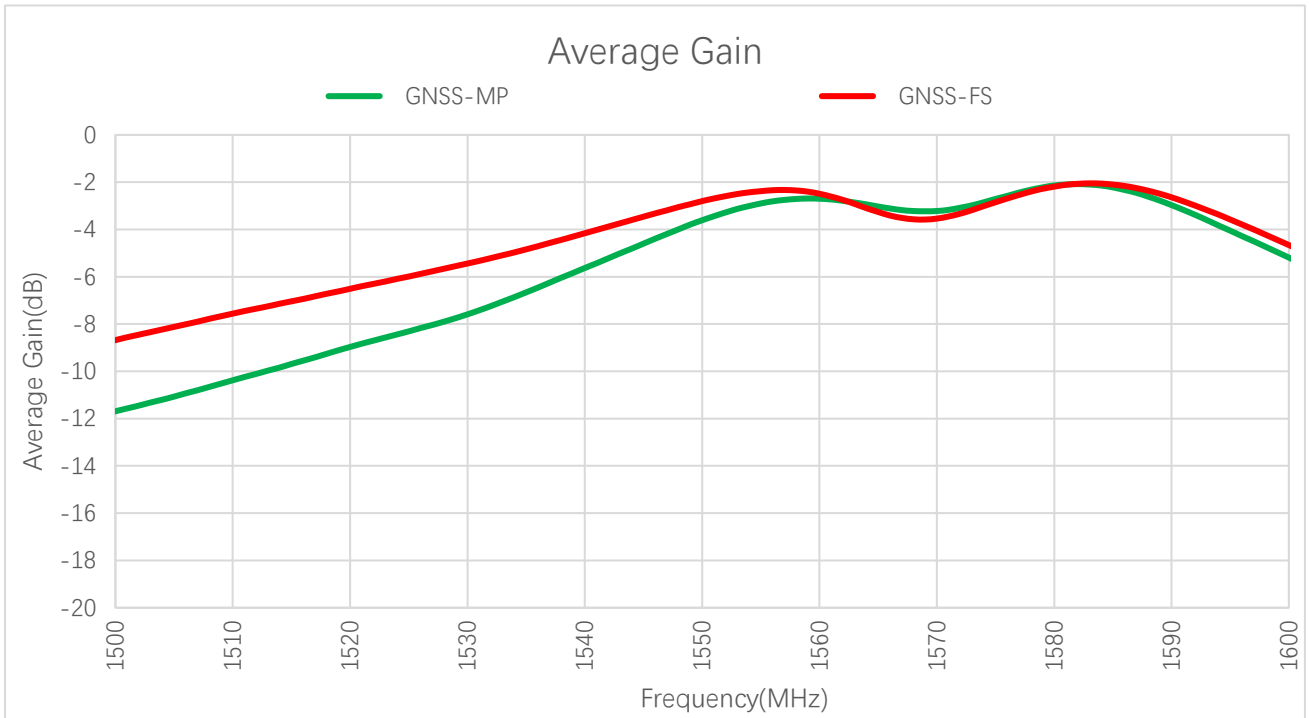
Frequency (MHz)		1176	1207	1227	1248	1268	1561	1575	1602
Efficiency (%)	MP	-	-	-	-	-	53.7	53.5	-
	FS	-	-	-	-	-	56.4	51.9	-

**3.2.2. Average Gain**



**Average Gain (dB) - 4G**

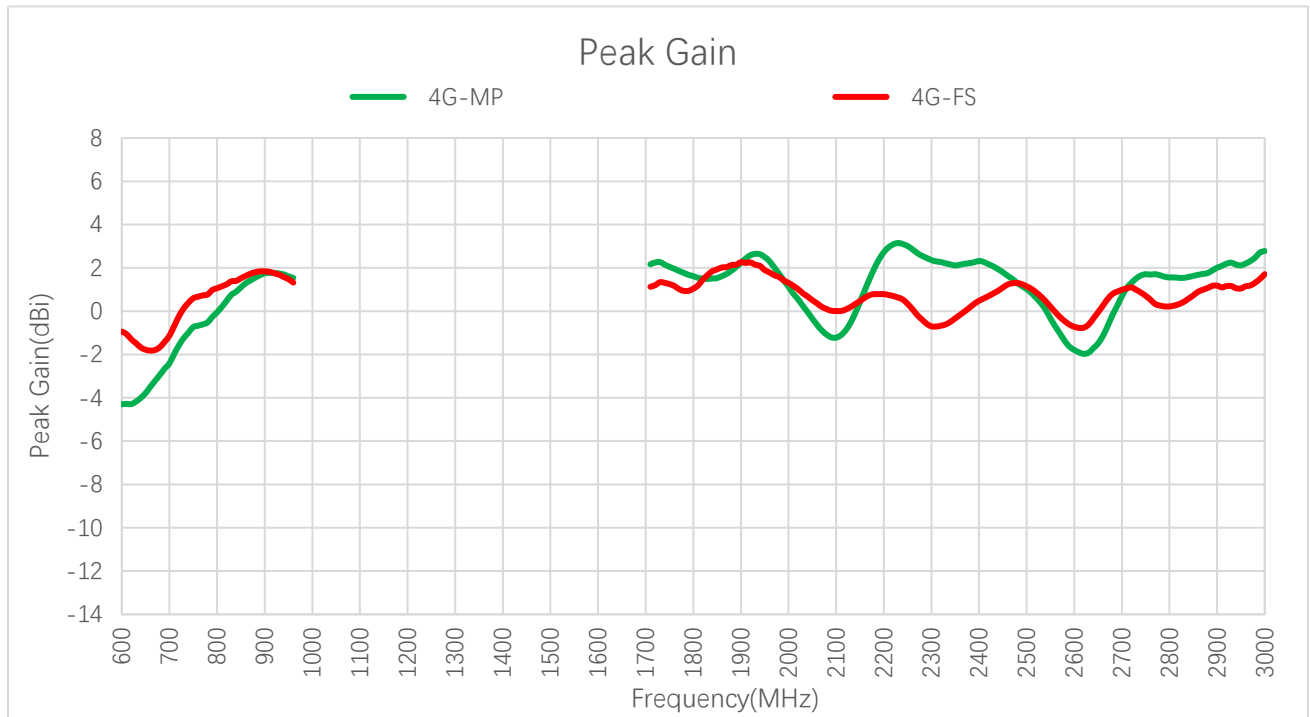
Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
Average Gain (dB)	MP	-	-	-6.1	-3.5	-4.7	-5.6	-	-2.5	-2.9	-5.4
	FS	-	-	-4.5	-2.8	-3.2	-3.3	-	-2.8	-3.1	-2.6
Frequency (MHz)		1950	2140	2350	2450	2600	2690	4700	5000	5500	6000
Average Gain (dB)	MP	-4.9	-5.9	-4.9	-5.0	-8.7	-6.5	-	-	-	-
	FS	-2.3	-4.0	-5.0	-3.7	-4.4	-2.6	-	-	-	-



**Average Gain (dB) - GNSS**

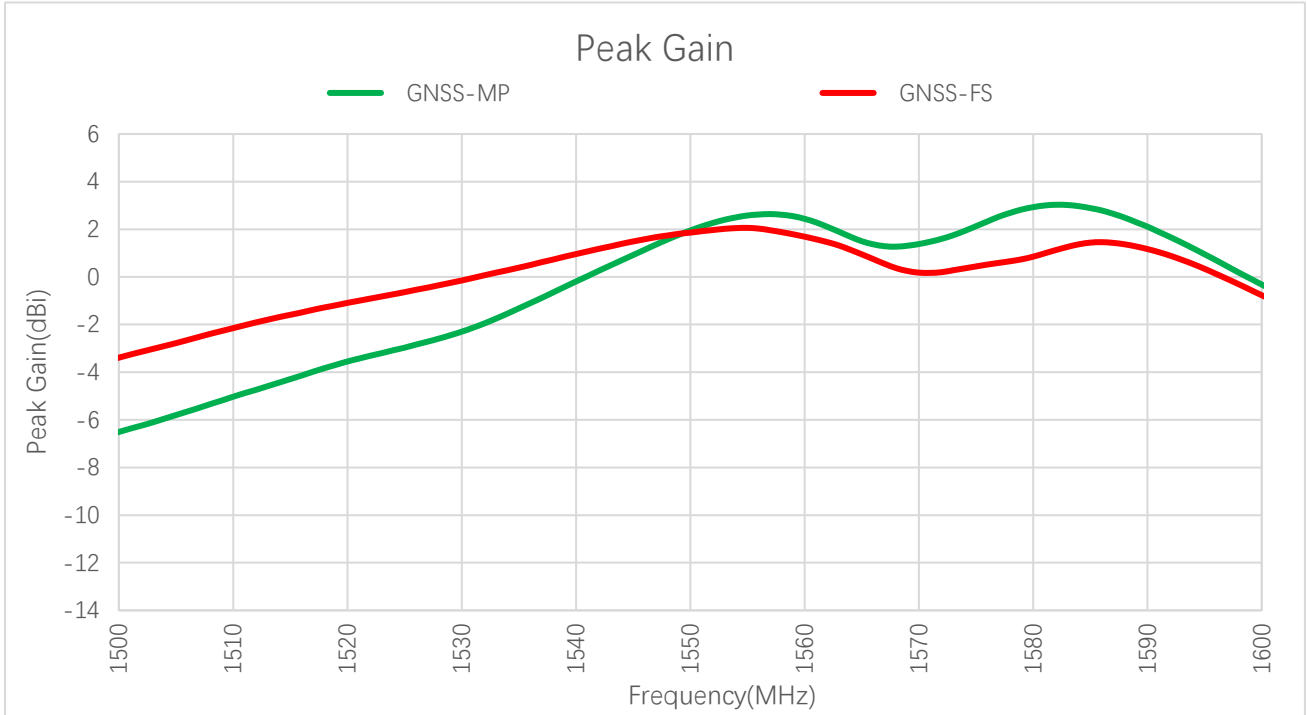
Frequency (MHz)		1176	1207	1227	1248	1268	1561	1575	1602
Average Gain (dB)	MP	-	-	-	-	-	-2.7	-2.7	-
	FS	-	-	-	-	-	-2.5	-2.9	-

**3.2.3. Peak Gain**



**Peak Gain (dBi) - 4G**

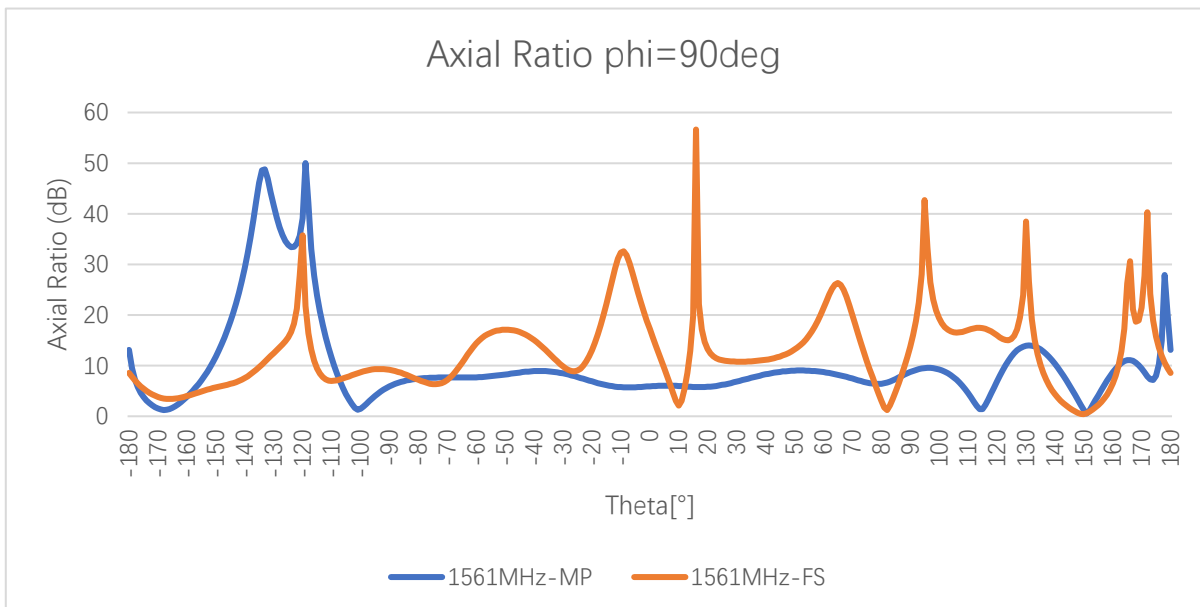
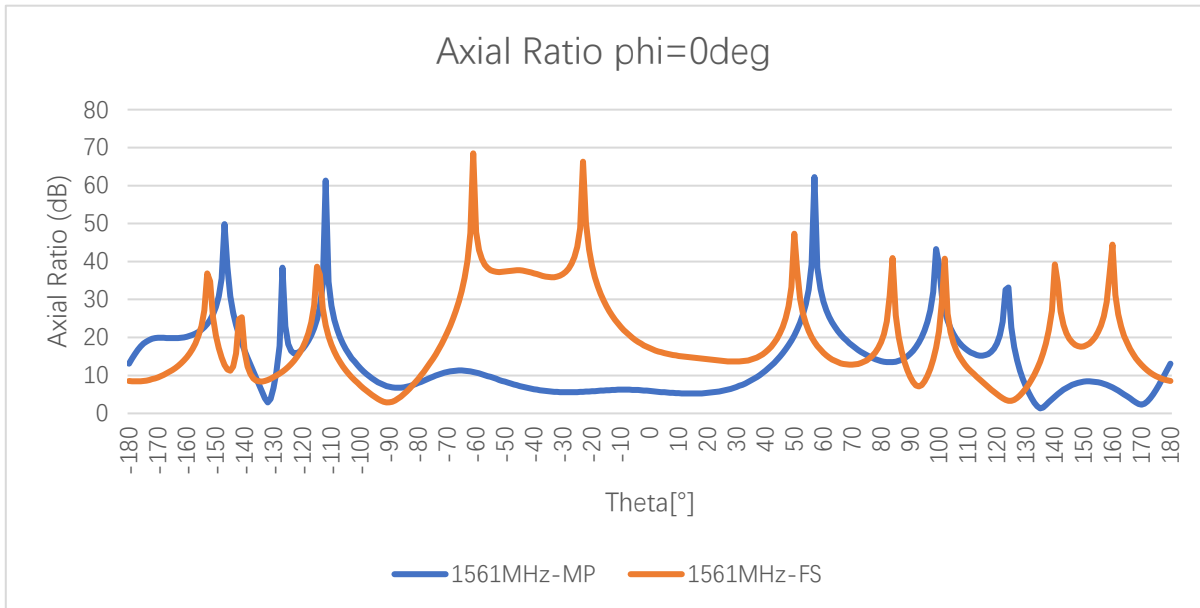
Frequency (MHz)		600	630	710	830	900	960	1440	1710	1740	1880
Peak Gain (dBi)	MP	-	-	-2.0	0.8	1.8	1.5	-	2.2	2.2	1.9
	FS	-	-	-0.7	1.4	1.8	1.3	-	1.1	1.3	2.1
Frequency (MHz)		1950	2140	2350	2450	2600	2690	4700	5000	5500	6000
Peak Gain (dBi)	MP	2.5	-0.1	2.1	1.8	-1.8	0.2	-	-	-	-
	FS	1.9	0.3	-0.3	1.1	-0.7	0.9	-	-	-	-



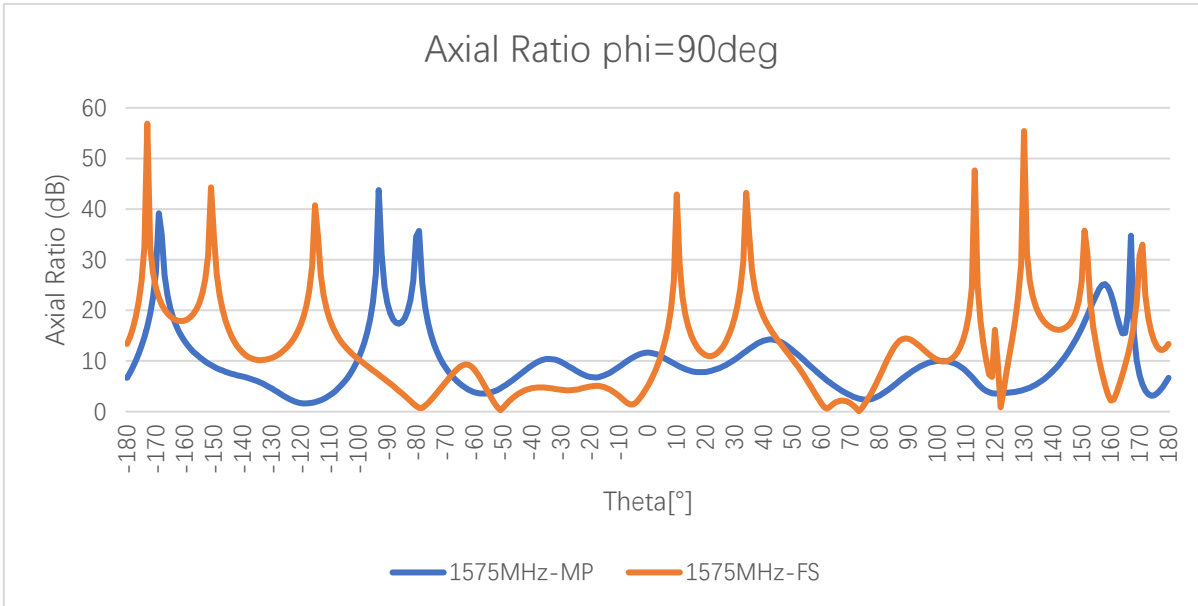
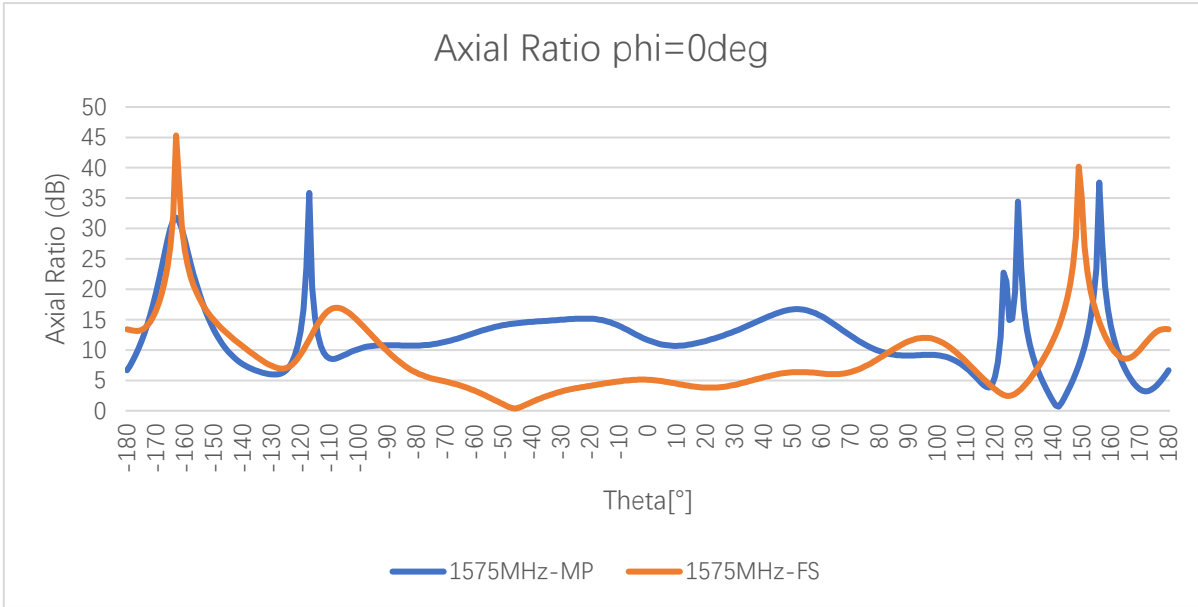
**Peak Gain (dBi) - GNSS**

Frequency (MHz)		1176	1207	1227	1248	1268	1561	1575	1602
Peak Gain (dBi)	MP	-	-	-	-	-	2.4	2.1	-
	FS	-	-	-	-	-	1.7	0.4	-

**3.2.4. Axial Ratio**







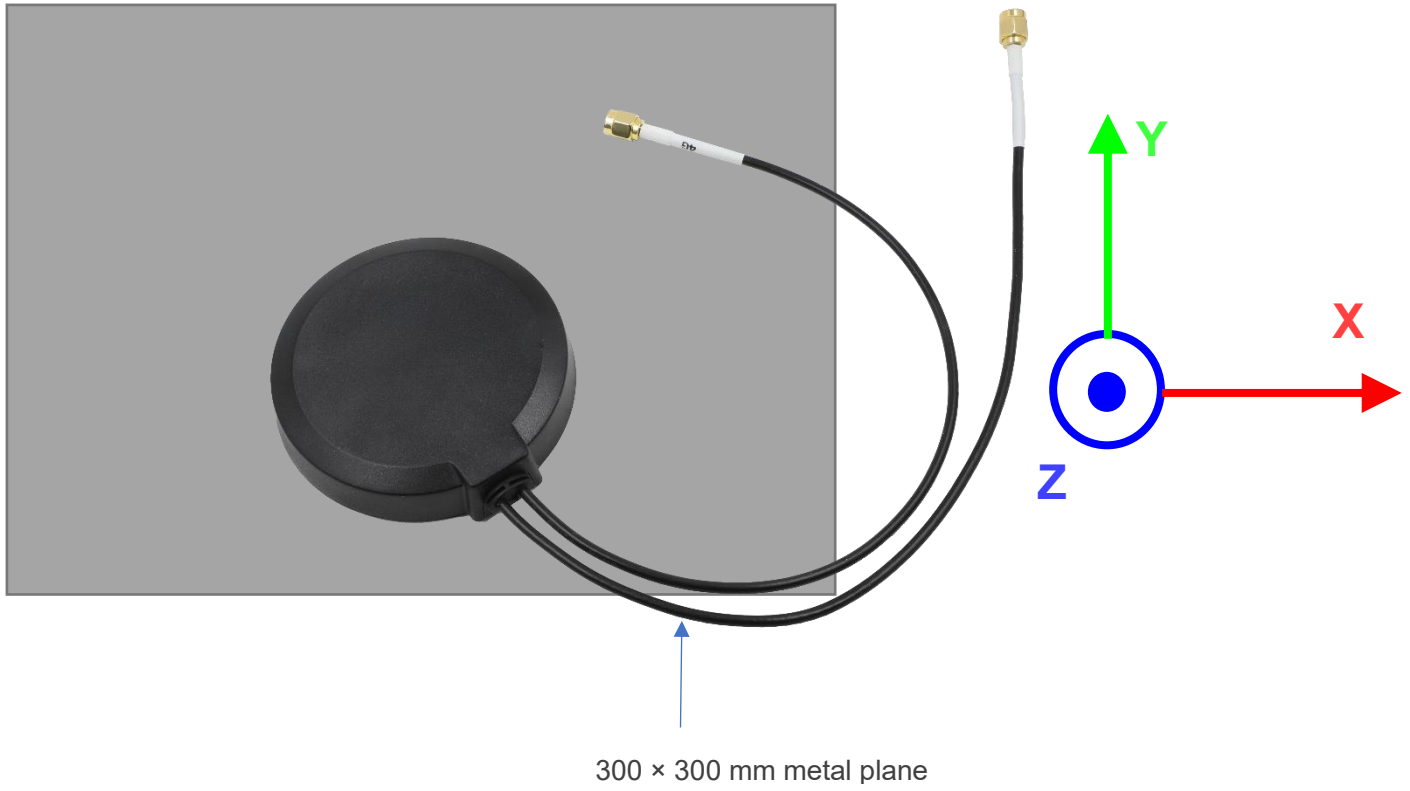
**Axial Ratio (dB)**

Frequency (MHz)			1176	1207	1227	1248	1268	1561	1575	1602
Axial Ratio (dB)	Phi = 0 (deg)	MP	-	-	-	-	-	5.9	11.6	-
		FS	-	-	-	-	-	17.2	5.1	-
	Phi = 90 (deg)	MP	-	-	-	-	-	5.9	11.6	-
		FS	-	-	-	-	-	17.2	5.1	-

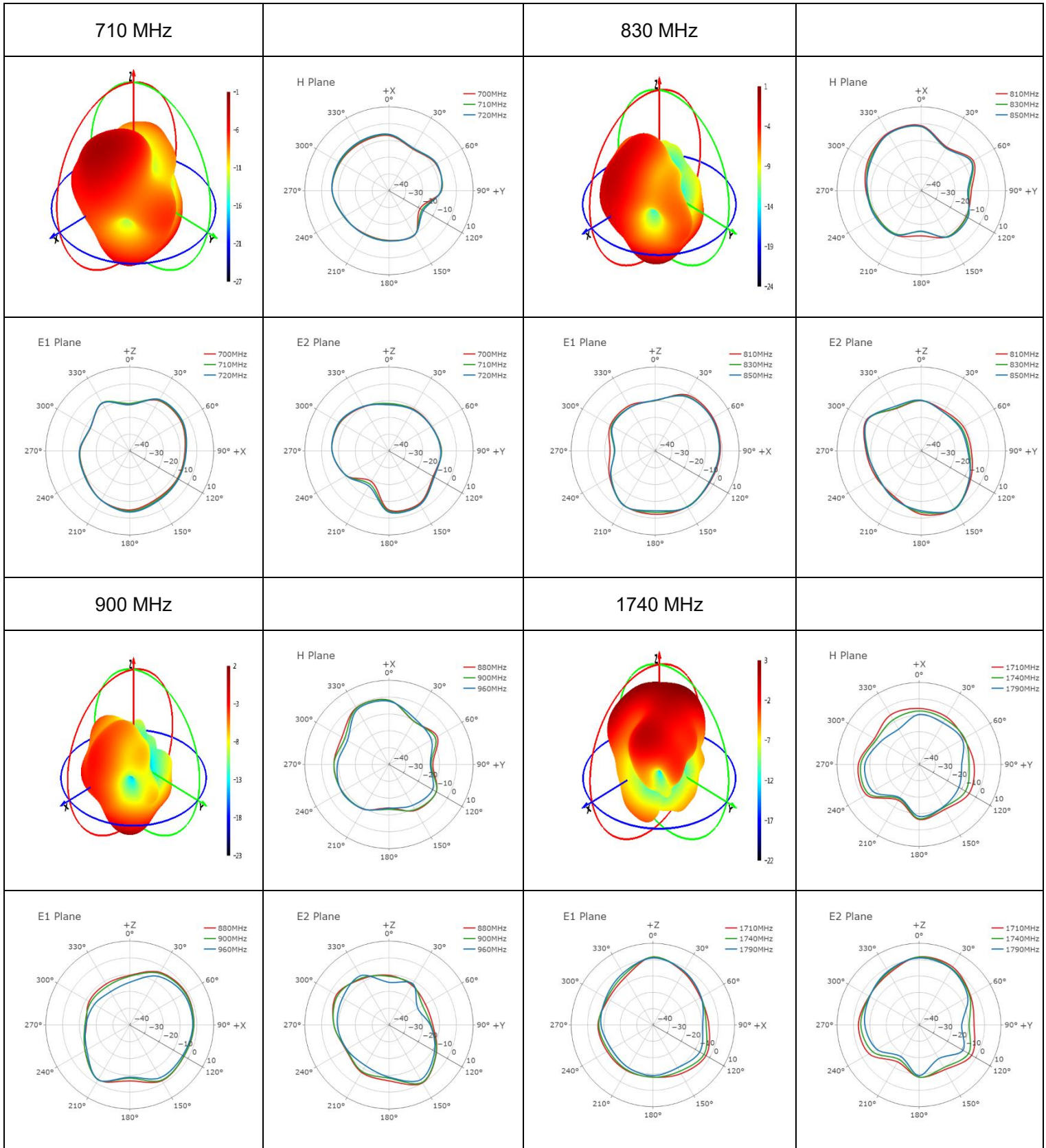
### 3.2.5. 3D & 2D Radiation Pattern

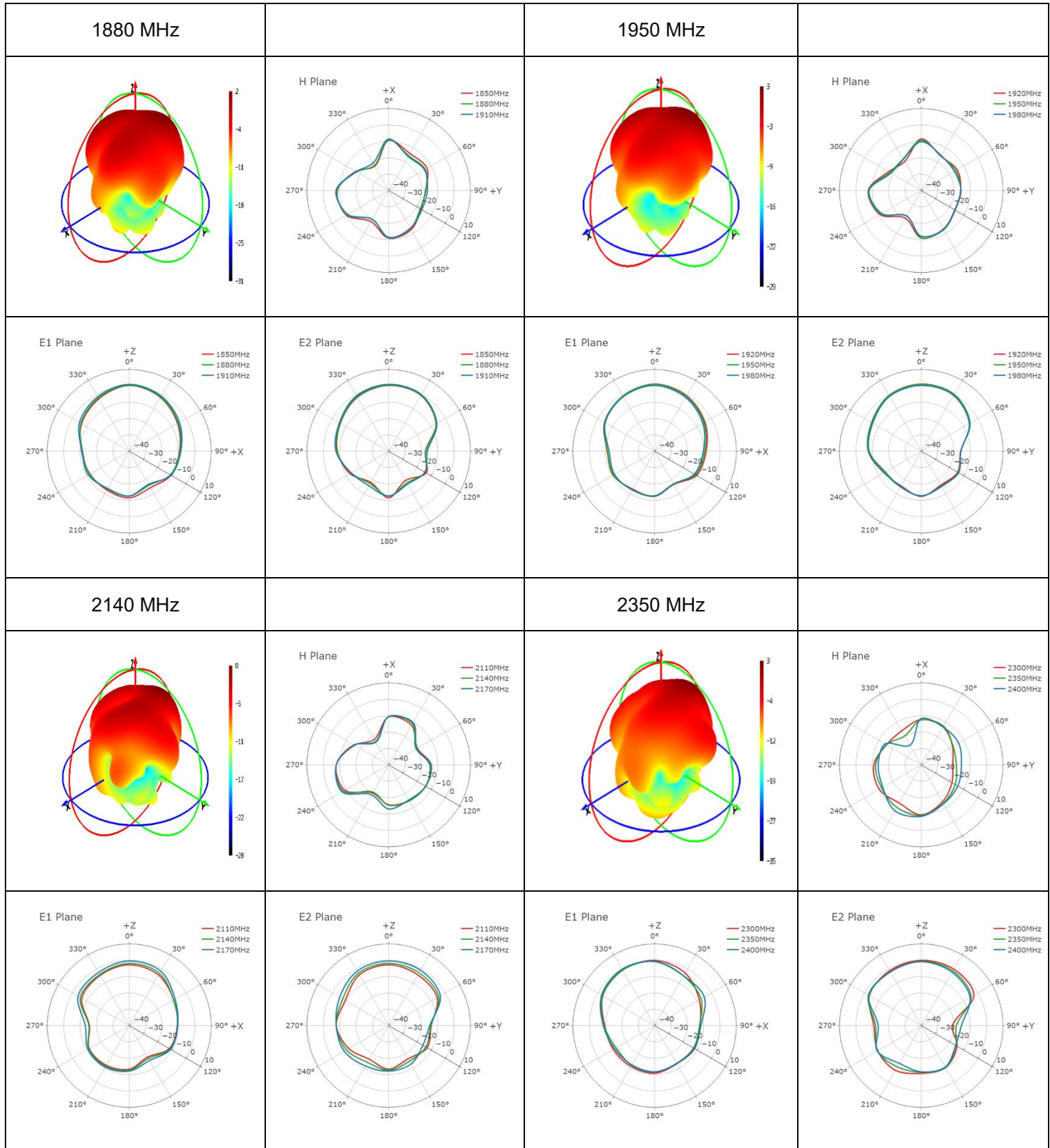
#### 3.2.5.1. Test Condition: On 300 × 300 mm Metal Plane

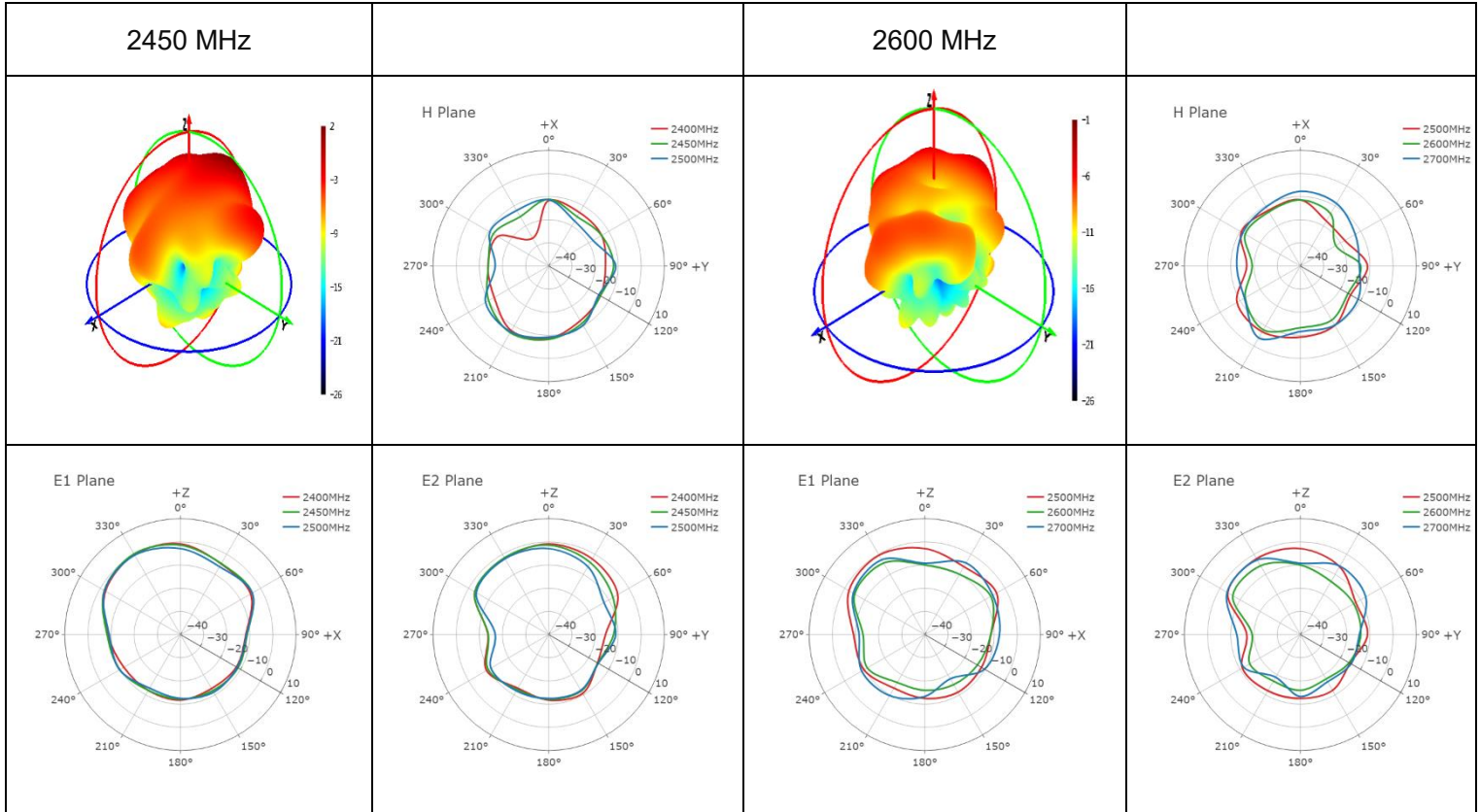
- Test Chamber: GL-S-1



● 4G

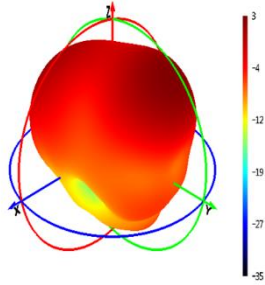




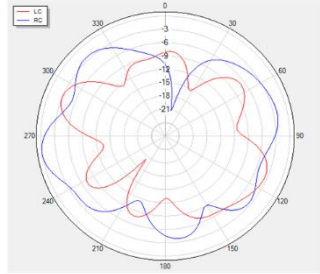


● **GNSS**

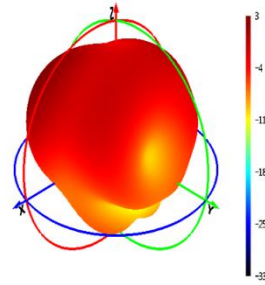
1561 MHz



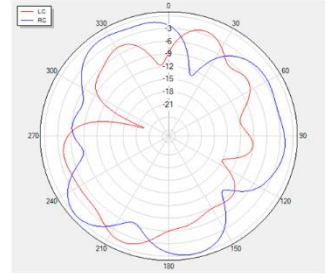
**Theta=90 freq=1561MHz**



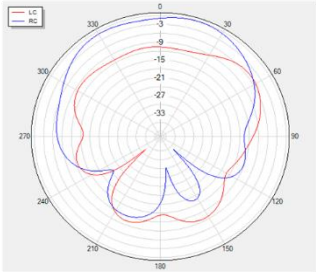
1575 MHz



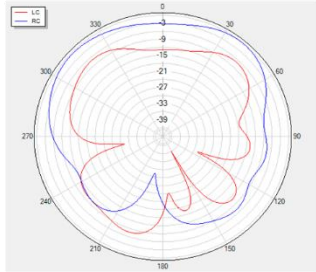
**Theta=90 freq=1575MHz**



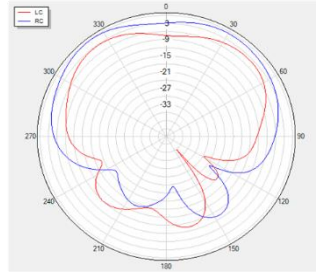
**Phi=0 freq=1561MHz**



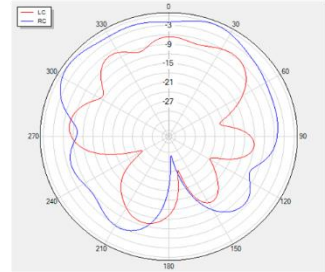
**Phi=90 freq=1561MHz**



**Phi=0 freq=1575MHz**

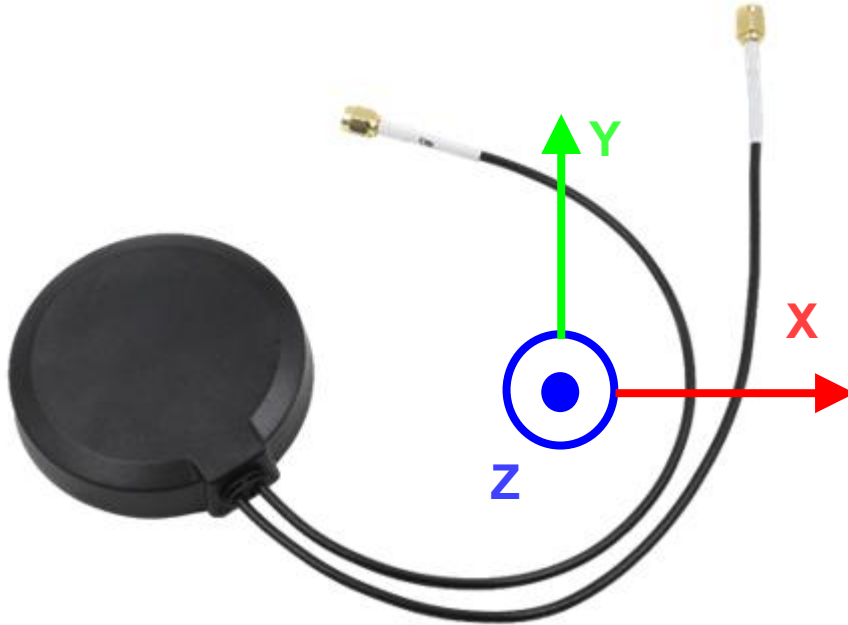


**Phi=90 freq=1575MHz**

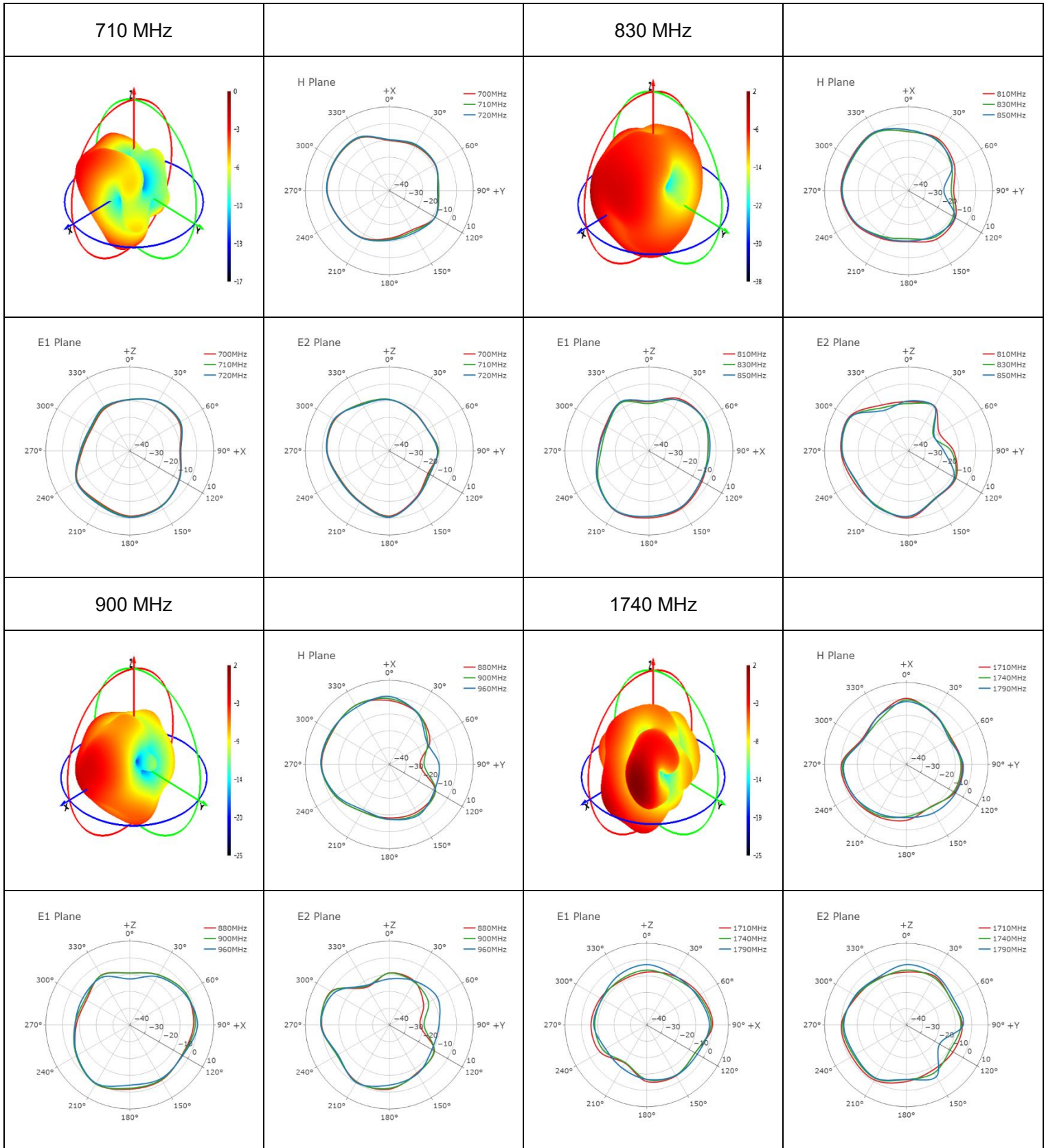


3.2.5.2. Test Condition: In Free Space

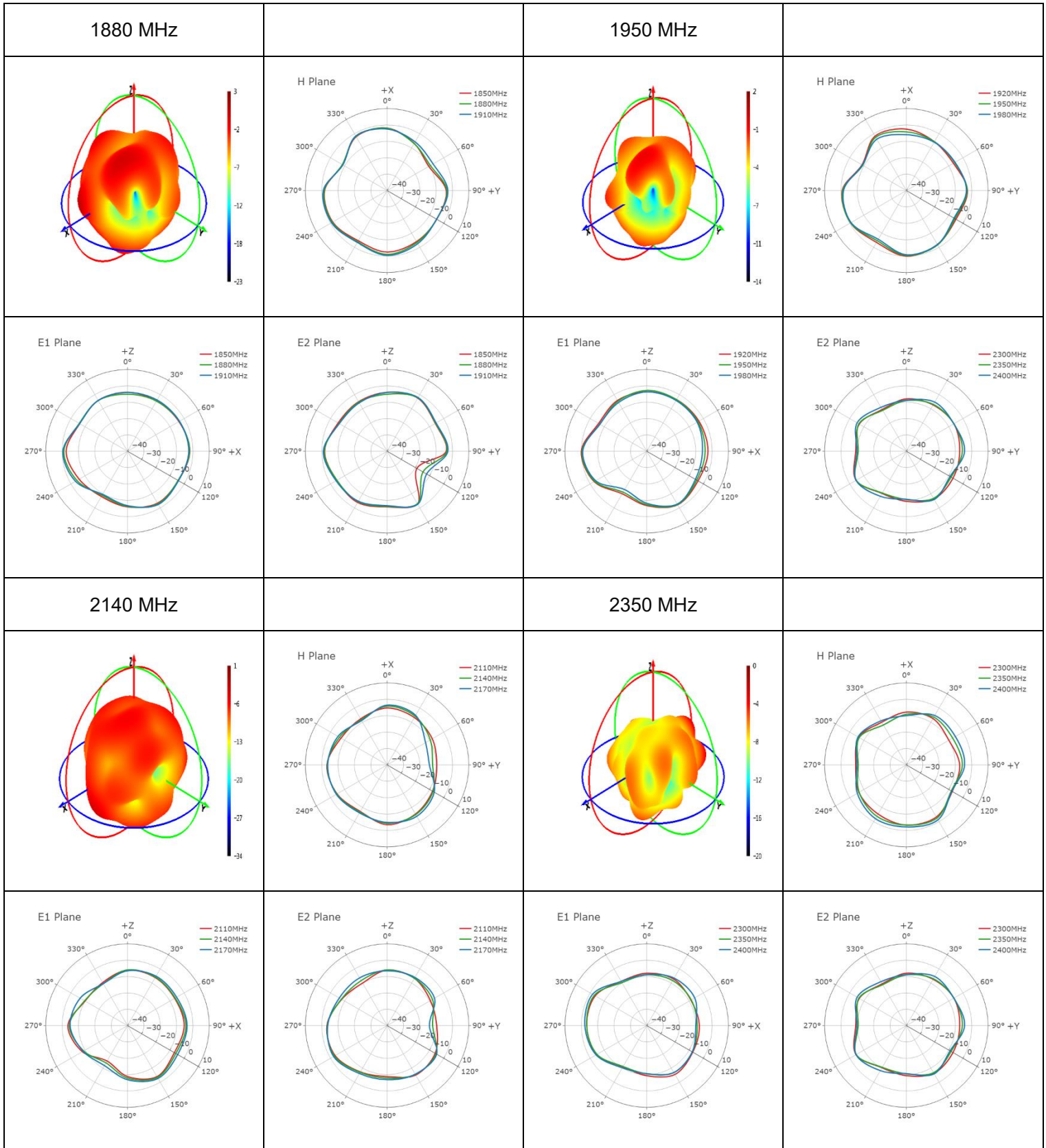
- Test Chamber: GL-S-1

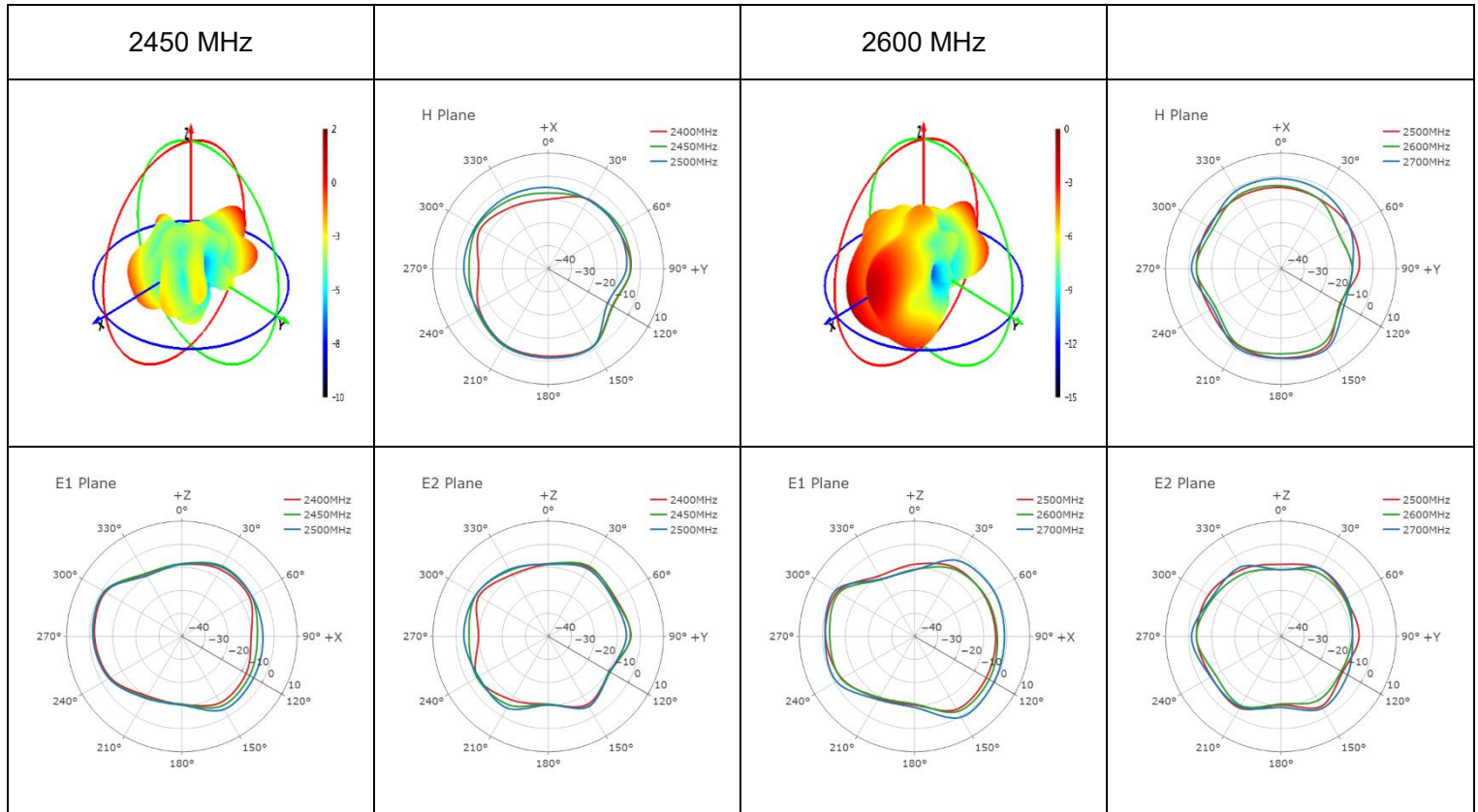


● **4G**





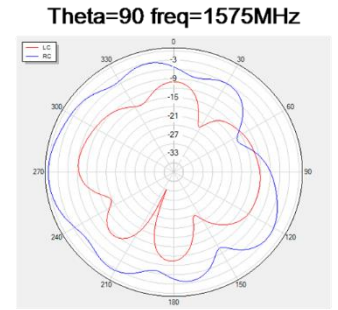
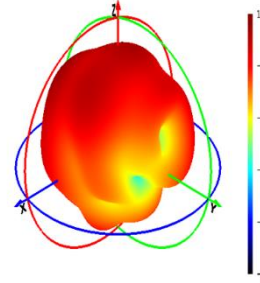
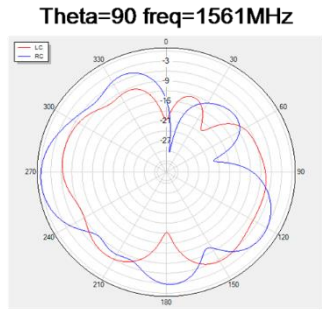
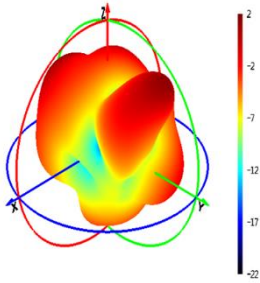




● **GNSS**

1561 MHz

1575 MHz

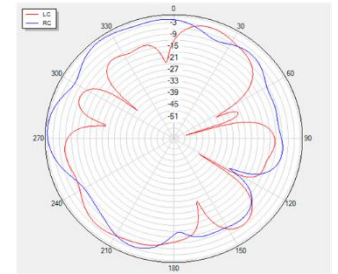
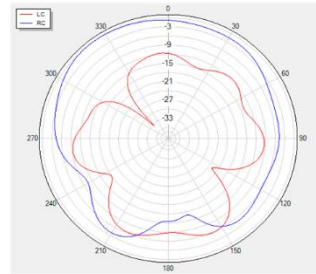
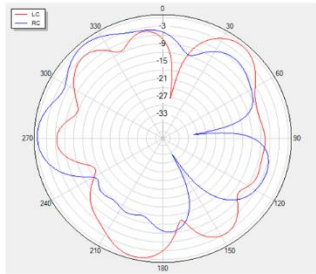
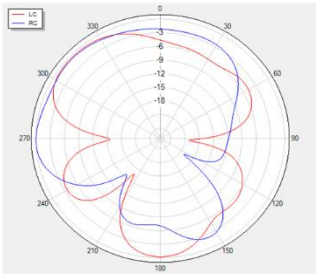


**Phi=0 freq=1561MHz**



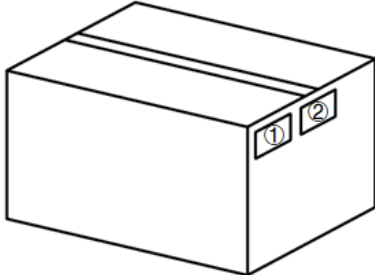
**Phi=90 freq=1561MHz**

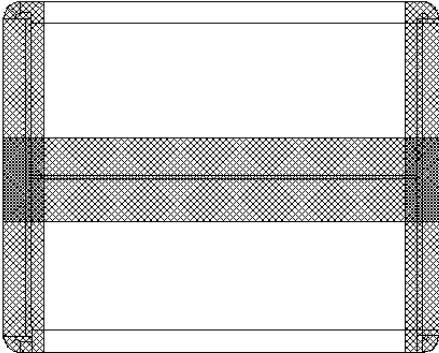
**Phi=0 freq=1575MHz**

**Phi=90 freq=1575MHz**



# 4 Packaging

Step	Packaging Picture / 2D Picture	Description
1		<p>20 pcs antenna products in a PE bag; (20 pcs antennas per PE bag)</p>
2		<p>(10 PE bags per carton box) (200 pcs antennas per carton box)</p> <p><u>Carton Size:</u> <u>L × W × H = 370 × 370 × 295 mm</u></p>
3		<p><b>Position for Attaching Labels</b></p> <p>① Carton Label ② Quality Label</p>

4		<p><b>Sealing Cartons</b> “I” type sealing cartons</p>
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## Contact Us

**At Quectel, our aim is to provide timely and comprehensive services to our customers. If you require any assistance, please contact our headquarters:**

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Tel: +86 21 5108 6236

Email: [info@quectel.com](mailto:info@quectel.com)

**Or our local offices. For more information, please visit:**

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# Revision History

Version	Date	Author	Note
-	2021-01-28	Kenny YIN	Creation of the document
1.0	2021-01-28	Kenny YIN	First official release
1.1	2021-07-25	Kenny YIN	Updated working temperature. (Chapter 3)
1.2	2021-10-08	Aria CHU	<ol style="list-style-type: none"><li>Updated the gain for GNSS and added the low noise amplifier electrical specifications (Chapter 3)</li><li>Updated the data (Chapters 4.2.2, 4.3.2 and 4.4.2)</li></ol>
1.3	2021-12-06	Aria CHU	Updated the product description (Chapter 1).
2.0	2023-09-07	Black LI/ Lucky FENG/ Kane HUANG/ David LIU/ Vinnie LIU	Updated all data in the datasheet.



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